4/26/1990

DRAFT

Permit No._____

Ground Water Quality Discharge Permit

STATEMENT OF BASIS

Dump Leach No. 3

Barrick Resources (USA) Inc.
Mercur Mine
P.O. Box 838
Tooele, UT 84074

Facility Description and Background:

Barrick Resources has applied for a ground water quality discharge permit for their new Dump Leach No. 3 facility located in the SW1/4, SW1/4, Sec 32, T.5S., R3W, and the NW1/4, NW1/4, Sec. 5, T.6S, R.3W, SLBM, Mercur Mining District, Tooele County, Utah. The facility is to be constructed for the cyanide leaching of gold-bearing subores from nearby open pit mining operations. The dump leach is located in Meadow Canyon, a northern fork of Mercur Canyon, and will consist of one leaching cell approximately 1700 feet long and 750 feet wide. At the end of the dump leach's 7.5 year projected life it will contain approximately 5.8 million tons of subore (200 ft thick). However, the maximum capacity of the dump leach is approximately 6.4 million tons, which equates to a subore fill thickness of 240 feet. An associated process plant will also be located at the facility for the control and distribution of barren leaching solutions and the carbon column processing of pregnant liquors.

Basis for Specific Conditions

1. Ground Water Classification - ground water has been classified as Class II, based on three samples from two monitoring wells at the site; including two samples from well MW-10 and one sample from well MW-11[1].

2. Background Ground Water Quality - background ground water quality has been defined on a well-by-well basis due to Barrick's selection of the EPA RCRA - approved intra-well control chart method for compliance monitoring. The Executive Secretary believes the ground water quality data available is within the anticipated range of background quality based on the lack of mining or other industrial development nearby. However, in order to comply with the EPA guidance for the control chart method ("Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities", Interim Final Guidance, February, 1989), Barrick will need to collect 16 to 30 independent ground water quality samples from each compliance monitoring well over at least a one year period of time, in order to build the initial control chart for each analyte. As a result, the permit includes conditions for this accelerated ground water sampling, see Part I H 5. After completion of this sampling, the mean concentration and standard deviation will be calculated for each parameter. If these new values differ from those currently assigned as background in Part I B (Table 1), the Executive Secretary will modify the permit (Part I H 5).

Part I B of the permit also recognizes that the existing monitoring wells at the facility may not form a complete and adequate compliance monitoring well network. Therefore, as additional compliance monitoring wells are added Barrick will conduct the one-year of sampling required in Part I H 5 in order to establish a statistical basis for background quality and build the necessary control-charts.

3. Ground Water Protection Levels - protection levels have been determined after review of the predicted chemical characteristics of the pregnant liquor[2] and in accordance with UAC R448-6-4.1B and 4.5; details are footnoted in Table 1 of the permit. Protection levels for two parameters however, have been determined on the basis of EPA drinking water life-time health advisories, as allowed by UAC R448-6-6.4A(1); cyanide- total (September 30, 1985) and nickel (March 31, 1987). Total analysis for cyanide is justified due to several factors, including:

   a. It is the method of analysis recommended by EPA in the September 30, 1985 Health Advisory.

   b. It is the analytical method in a soon to be proposed EPA drinking water maximum contamination level (MCL)[3]. MCLs form the basis for most of our existing Ground Water Quality Standards.

   c. The complex chemistry of the pregnant liquor, with its myriad of highly soluble cyanide salts, and alkali-heavy metal complexes justifies a conservative form of cyanide analysis.

   d. The human toxicity of the cyanide salts and many of the complexes also justifies a conservative test.

   e. The uncertainty of contaminant detection by a ground water monitoring well network and the unknown capacity of dispersion, adsorption, biodegradation, oxidation, and other contaminant mitigating subsurface processes also justifies conservative examination methods.

Barrick has raised a concern over the use of Total Cyanide analysis. To address this concern Weak Acid Dissociable Cyanide analysis has been included in the sampling parameters in Part I E 7(b)(3).

If after completion of the Accelerated Background Sampling required in Part I H 5, the Executive Secretary determines that the background values in the permit must be modified, new protection levels will be determined for each parameter (except pH), based on the new mean background concentration and standard deviation in accordance with UAC R448-6-4.5.

The background concentration for cadmium may also change after the Accelerated Background Sampling (Part I H 5) due to the fact that the analysis used by Barrick in the permit application had a minimum detection limit equivalent to the ground water quality standard. This analysis does not allow the Executive Secretary to set a protection level below the ground water quality standard, and as such frustrates the early warning intent of the protection levels concept. It is anticipated that this will be resolved as Barrick complies with the analytical method requirements [Part I E 7(b)(2)(ii)] and the background concentration is confirmed through the accelerated sampling (Part I H 5).

4. Best Available Technology Standard - design of the dump leach includes a synthetic membrane/clay/synthetic membrane composite bottom liner system; which should provide total containment of the pregnant solutions in the dump; or in other words a no-discharge design[4]. A total coverage leak detection system below the primary synthetic membrane has been ruled out by Barrick in the design of Dump 3 due to past experience with such a design in Dumps 1 and 2, both of which experienced primary synthetic liner failure shortly after commencement of operation[5]. The new design for Dump 3, i.e. the union of a primary synthetic membrane, a clay middle liner, and a secondary synthetic membrane forms a major improvement in fluid containment over the former design used in Dumps 1 and 2.

In contrast to Dumps 1 and 2, Dump 3 will not incorporate a total coverage, rapidly reporting leak detection system. Instead, Barrick has proposed a limited system found beneath the middle clay liner, that will monitor only a narrow zone at the bottom of dump leach[6]. Barrick has cited construction difficulties and potential damage to the secondary membrane liner as justification for their scaled-down leak detection design[5]. After due consideration, the Executive Secretary has determined that the proposed leak detection design could not be used as a primary compliance monitoring point. As a result, compliance monitoring of the facility will be accomplished by an adequate network of ground water monitoring wells.

The authorized engineering design and construction shall meet the terms and conditions of the Construction Permit to be issued by the Executive Secretary.

In order to meet the EPA prerequisite of one year of ground water sampling data for the use of the intra-well control chart compliance monitoring method, (Part I E 1) Barrick is required to ensure that there will be no release of leachate during the period of accelerated background sampling required in Part I H 5. This was accomplished by regulating releases from both the dump's liner and by spills, as follows:

a. Control of Liner Releases - for conservative purposes it was assumed that both synthetic membranes in the lining system had completely failed and that the clay secondary liner was the only barrier to seepage losses. Then the minimum thickness, maximum hydraulic conductivity, and maximum head in the process pool head were limited in the permit to ensure that a hypothetical seepage of pregnant liquor through the clay would not leave the dump before the conclusion of the accelerated sampling period (Part I H 5). Average linear velocity calculations, conservative because of their assumption of saturated flow conditions thru the clay, were based on the permit's limitations [Part I D 2 (a and b), and 3] and a conservative clay porosity estimate of 0.4. Given these conditions, the calculations indicate that the pregnant liquor would take approximately 1.16 years to penetrate the clay secondary liner. Though dispersion could shorten the travel time through the clay, the Executive Secretary believes this would be more than offset by the unsaturated flow considerations, and the time necessary to travel through the underlying vadose zone to the water table, in excess of 600 feet below the dump.

Furthermore, lixiviant will not be applied to the dump leach until after subore loading, anticipated near the first week of December, 1990. This means that the 1.16 year "clock" would not expire until sometime in January, 1992. Both Barrick and the Executive Secretary believe that this is sufficient time to complete an adequate monitoring well network and provide the necessary sampling for use of the control chart method.

b. Control of Spill Releases - by control and containment of all spills at and around the dump leach, the release of contaminants to the ground and ground water should be prevented, and therefore ensure that the necessary one-year of sampling can be completed for use of the control chart method.

Spill containment is a necessary element of the design and construction in order to ensure a true no-discharge design. Consequently, the permit requires spill containment systems for other elements of the facility that convey or store fluids, including pipelines, storage tanks, and the carbon column treatment units. Adequate containment will prevent spills from any contact with the ground, and will convey them directly to the impoundment of Dump 3, or to some other containment system approved by the Executive Secretary. Adequate design and construction of the spill containment systems will be determined in the Construction Permit.

If in the event any fluid appears in the leakage collection system, Barrick will be required to return it to the process circuit. In no event will such fluid be discharged to surface or ground waters.

5. Compliance Monitoring - Barrick has selected a compliance monitoring method, approved by EPA, which uses solely downgradient compliance monitoring wells, i.e. the intra-well control chart method. As outlined by the EPA guidance, entitled "Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities", the method requires the following prerequisites:

a. Uncontaminated monitoring wells, adequately located downgradient of the facility.

b. Collection of 16-30 independent ground water samples over at least a one-year period of time.

c. Correction for seasonal variation in the sampling data, this is possible after the initial one-year sampling period.

d. Use of a Shewhart - CUSUM control chart for each constituent in each well, as per EPA guidance.

Discussion found in Sections 2, 3, and 4, above, explain the limitations in the permit which allow Barrick to meet these criteria. If Barrick elects to use another compliance monitoring or statistical method, prior Executive Secretary approval will be required.

The process of determining compliance with the permit will be accomplished in a two-step process, as follows:

a. Protection Level Comparisons - after the one-year of accelerated sampling (Part I H 5) and the background concentrations and protection levels have been confirmed, sample results will be compared to the protection levels in the permit. If any protection level is exceeded, probable-out-of-compliance status will exist, and Barrick will immediately resample, increase their sampling frequency to monthly, and notify the Executive Secretary, as per Part I F 1 of the permit.

b. Control Chart Comparisons - if after the increased sampling, the protection level comparisons indicate an exceedance exists in two consecutive samples (two months in a row), control chart comparisons will be used to confirm out-of-compliance status, in accordance with the EPA RCRA guidance (Part I E 1). If said status exists, Barrick will comply with the requirements of Part I F (2) of the permit.

Because Barrick has ruled out the feasibility of a total coverage, rapidly reporting leak detection system, ground water monitoring remains as the only recourse for compliance monitoring. Consequently, Barrick must install a viable monitoring well network that will accurately determine the compliance status of the facility. to ensure Barrick is able to accomplish this objective several requirements have been put into the permit for the monitoring wells. At Barrick's request, the minimum number of wells has not been specified, but will be determined later, based on the individual hydrogeologic characteristics of the site. However, if more than one aquifer exists under the facility, Barrick will install an adequate number of wells into each aquifer. Under no circumstances will lixiviant be applied onto the dump leach without a complete and approved monitoring well network. Failure to construct a monitoring well network that meets the requirements of Part I E 2 of the permit shall constitute a failure to monitor and a violation of the permit conditions. If the well network is found inadequate for any reason during the life of the permit, the Executive Secretary will require Barrick to make the necessary modifications. Exceedance of the protection levels at the downgradient wells, will also constitute noncompliance. Compliance monitoring will commence with completion of the wells, and will be conducted throughout the permit's life.

Compliance monitoring will be conducted on a quarterly basis, including water level measurements, ground water sampling of downgradient compliance monitoring wells, sampling of the leachate collection tank, if fluids are present, and process pool head monitoring. Monitoring of the process pool head and visual observation of the leachate collection tank for fluids will be conducted daily.

Sample analysis will be conducted by State-certified laboratories and by approved methods. Approved methods will include those with minimum detection limits less than the ground water protection levels (Part I C, Table 1) in order to:

a. To establish an adequate protection level for cadmium, see related discussion in Section 3, above, and

b. Limit the number of nondetectable values that will need to be statistically manipulated by the control chart compliance method.

It should be noted that it may be to Barrick's advantage to use analytical methods with detection limits well below the protection levels (Part I C, Table 1) in order to provide an opportunity to detect and correct instrument and other errors before triggering Probable-out-of-Compliance status (Part I F 1) with an exceedance of a protection level.

The analysis parameters include the protection levels, field measurements, general ion species, cyanide degradation products, and thallium. Thallium is currently a parameter under study by EPA for determination of a drinking water health advisory and maximum contaminant level. Any fluids occurring in the leachate collection system will be sampled on a quarterly basis, per the same criteria, and returned to the process circuit. Process pool head monitoring will be conducted to document the driving head on the liner and to ensure the process pool is maintained over the area where the clay secondary liner is at least 3 feet thick.

Post-closure monitoring will be required later in the operational life of the facility. Details on what activities will be included and frequency of monitoring will be determined at a later date (Part 1 H 8).

6. Non-Compliance Status - procedures consistent with the GWQP Regulations are outlined by which Barrick will determine probable-out-of-compliance and out-of-compliance status (UAC R448-6-6.16 through 6.18). It shall be the burden of Barrick to evaluate the ground water quality data, make these determinations, notify the Executive Secretary, and accelerate their ground water monitoring schedule based on the procedures outlined. See related discussion in Section 5, above. In the case of out-of-compliance status, a Source and Contamination Assessment Study Plan will also be required from Barrick.

7. Reporting Requirements - requirements are provided for the reporting of the results of quarterly monitoring. Spills are defined and spill reporting to the Executive Secretary shall be in compliance with the 24-hour reporting requirements of Part II I. The reporting of post-closure monitoring will be determined later in a Post-Closure Monitoring Plan.

8. Compliance Schedule

   a. Q.A./Q.C. Ground Water Monitoring Plan - The Executive Secretary has reviewed Barrick's ground water monitoring quality assurance plans in an earlier submittal and provided comments. Barrick shall modify the plan based on those comments and return it for approval. Upon Executive Secretary approval the plan will become enforceable under the permit.

   b. Contingency Plan - Barrick failed to submit an adequate Contingency Plan in the original application. Consequently, an adequate plan will be submitted and approved before any subore goes into the dump.

c. Dump No. 3 Site Hydrogeological Report - the hydrogeological report submitted by Barrick determined that the ground water flow system at the Dump 3 site is not well known[7]. This information is critical to the design and construction of an adequate monitoring well network. Therefore Barrick will complete these studies and define the local ground water flow system for each uppermost aquifer under the site in order to provide adequate compliance monitoring required by Part I E(2) of the permit. This report will also be submitted to the Executive Secretary and approved before lixiviant is applied to any subore in the dump.

d. Monitoring Well Requirement - well construction will conform to UAC R448-6-6.3A(9)(f) or the EPA RCRA Ground Water Monitoring Technical Enforcement Document. An "As-Built" report will be submitted thereafter to confirm construction with these criteria. Inadequate well construction will constitute non-compliance, as per Part I E(2)(g) of the permit.

e. Accelerated Background Sampling - sample collection from the compliance monitoring wells will begin immediately and follow a rigorous schedule for at least one year to confirm the initial values submitted in the application, see related discussion in Section 5, above. Monthly reporting will allow the Executive Secretary to monitor ground water quality during the accelerated sampling period. At the conclusion of this sampling a Background Ground Water Quality Report will be submitted for each well. Based upon this report the Executive Secretary may modify the permit as deemed necessary (Permit Part IV N).

f. Conceptual Closure Plan - after review of the closure and reclamation procedures outlined in the application[8], the Executive Secretary determined that several elements need modification, as outlined by in a letter to Barrick dated May 7, 1990. Barrick will modify the procedures as per the May 7, 1990 comments, and resubmit them as a Conceptual Closure Plan. Because the permit's life (5 years) is less than the facility's life (7.5 years), detailed plans will not be required at this time, but will be required as a condition of the renewed permit. However, the Conceptual Closure Plan shall form the basis for detailed plans to be required in the next permit cycle.

g. Anticipated Date of Closure - Barrick shall provide an anticipated date of closure at the time of permit renewal. This will allow conditions and time schedules to be established for a detailed closure plan and dump closure in the renewed permit.

h. Conceptual Post-Closure Monitoring Plan - The permit application did not include any plans for post-closure monitoring of the dump leach. Consequently, Barrick will provide a conceptual plan for Executive Secretary approval in accordance with guidance provided to Barrick in a letter of May 7, 1990. The approved conceptual plan will then from a basis for a final plan to be prepared by Barrick at the time of closure in the next permit cycle.

i. Notice of Dump Leach Construction and Commencement of Operation - this notice is required by UAC R448-6-6.11A.

FOOTNOTES

(1) Barrick letters to Don Ostler, dated April 17 and 26, 1990.

(2) Ground Water Assessment for Dump Leach Area #3, Barrick Mercur Gold Mine, Utah for Barrick Resources (USA), Inc., Dames & Moore, Salt Lake City, Utah January 1990, Table 1, and
Barrick Nature of Ground Water Discharge Notification, dated February 9, 1990, Water Quality Analysis of Dump Leach No. 2 Pregnant Solution, August 3, 1989 sample.

(3) Personal communication, Robert Benson, EPA Region VIII Toxicologist, Drinking Water Branch, October 18, 1989.

(4) Dump Leach No. 3 Design Document, Barrick Resources (USA) Inc., Mercur Mine, February 1990, Drawing No. 8-89-3.

(5) ibid., p. 11 and 12.

(6) ibid, Drawings Nos 8-89-1 and 8-89-3.

(7) Ground Water Assessment for Dump Leach Area #3 Barrick Mercur Gold Mine, Utah for Barrick Resources (USA), Inc., Dames & Moore, Salt Lake City, Utah, January, 1990, p. 8.

(8) Dump Leach No. 3 Design Document, Barrick Resources (USA) Inc., Mercur Mine, February, 1990, p.34.

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